AMENDMENTS TO THE CLAIMS

1. (currently amended) A process for noise reduction from noisy data representing an artifact at sample points in two dimensional space of a wafer specimen, comprising the steps of:

receiving said noisy data as a vector, each element of which corresponds to one sample point; and

calculating coefficients of a polynomial which converts said noisy data vector to a two dimensional function continuously representing the artifact in the two dimensional space,

wherein said noisy data is obtained using a ~~measuring~~ wafer measurement apparatus, said noise being induced in said noisy data by movement of said wafer specimen within said wafer measurement apparatus, and

wherein said calculating step includes mathematically multiplying said data vector by a matrix representing a noise characteristic of said ~~measuring~~ wafer measurement apparatus to achieve said noise reduction from said noisy data.

2. (previously presented) The process of claim 1 wherein said sample points lack regular geometrically prescribed locations on said wafer specimen.

-2-

WEINGARTEN, SCHURGIN,
GAGNEBIN & LEBOVICI LLP
TEL. (617) 542-2290
FAX. (617) 451-0313

PAGE 4/20 * RCVD AT 6/28/2006 2:42:26 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/0 * DNIS:2738300 * CSID:6176950892 * DURATION (mm-ss):05-08

3. (previously presented) The process of claim 1 wherein said wafer specimen is a non-rectilinear specimen.

4. (previously presented) The process of claim 1 wherein the sample points have a sufficiency to represent the spatial frequency of the noise to be reduced.

5. (original) The process of claim 1 wherein said polynomial is a Zernike polynomial.

6. (original) The process of claim 1 wherein said calculated coefficients are fewer in number than the number of sample points.

7. (previously presented) The process of claim 1 wherein said calculating step includes mathematically multiplying said data vector by the matrix representing the noise characteristic of said measuring apparatus, and wherein said matrix represents a least squares fit between said data vector and the polynomial.

8. (original) The process of claim 7 wherein said matrix is a single value decomposition of said two dimensional space as applied to said apparatus.

-3-

9. (previously presented) The process of claim 1 further comprising the step of calculating specimen spatial artifacts from said polynomial for one or more points in said two dimensional space.

10. (previously presented) The process of claim 9 further comprising the step of transmitting said coefficients to a remote location prior to the calculation of spatial artifacts from said polynomial.

11. (currently amended) A process for generating a noise correcting matrix for a wafer measurement apparatus, comprising the steps of:

receiving data representative of artifacts in two dimensional space of a wafer specimen obtained by said wafer measurement apparatus, each data point associated with a data position,

wherein movement of said wafer specimen within said wafer measurement apparatus induces noise in said data; and

calculating a specimen-independent noise compensating matrix as a function of said data position in two dimensional space on said wafer specimen,

-4-

wherein said matrix represents a noise characteristic of said wafer measurement apparatus, and

wherein noise reduction in said data is achieved by mathematically multiplying said data by said matrix.

12. (original) The process of claim 11 wherein said calculating step applies least squares fit analysis.

13. (original) The process of claim 11 wherein said matrix is of the form of a multiplier of Zernike polynomial decomposition coefficients.

14. (currently amended) An apparatus for noise reduction from noisy data representing an artifact at sample points in two dimensional space of a wafer specimen, comprising:

means for receiving said noisy data as a vector, each element of which corresponds to one sample point; and

means for calculating coefficients of a polynomial which converts said noisy data vector to a two dimensional function continuously representing the artifact in the two dimensional space,

-5-

wherein said noisy data is obtained using a ~~measuring~~ <u>wafer</u> measurement apparatus, <u>said noise being induced in said noisy data</u> <u>by movement of said wafer specimen within said wafer measurement</u> <u>apparatus,</u> and

wherein said calculating means includes means for mathematically multiplying said data vector by a matrix representing a noise characteristic of said ~~measuring~~ <u>wafer</u> <u>measurement apparatus</u> <u>to achieve said noise reduction from said</u> <u>noisy data</u>.

15. (previously presented) The apparatus of claim 14 wherein said wafer specimen is a non-rectilinear specimen.

16. (previously presented) The apparatus of claim 14 wherein the sample points have a sufficiency to represent the spatial frequency of the noise to be reduced.

17. (original) The apparatus of claim 14 wherein said polynomial is a Zernike polynomial.

18. (original) The apparatus of claim 14 wherein said calculated coefficients are fewer in number than the number of data points.

-6-

19. (previously presented) The apparatus of claim 14 wherein said matrix represents a least squares fit between the data vector and the polynomial.

20. (original) The apparatus of claim 19 wherein said matrix is a single value decomposition of said two dimensional space as applied to said measuring apparatus.

21. (original) The apparatus of claim 14 further comprising means for calculating specimen spatial artifacts from said polynomial for one or more points in said two dimensional space.

22. (original) The apparatus of claim 21 further comprising means for transmitting said coefficients to a remote location prior to the calculation of spatial artifacts from said polynomial.

23. (currently amended) Apparatus for generating a noise correcting matrix for a wafer measurement apparatus, comprising:

means for receiving data representative of artifacts in two dimensional space of a wafer specimen obtained by said wafer

-7-

measurement apparatus, each data point associated with a data

position,

wherein movement of said wafer specimen within said wafer

measurement apparatus induces noise in said data; and

means for calculating a specimen-independent noise

compensating matrix as a function of data position in two

dimensional space on said wafer specimen,

wherein said matrix represents a noise characteristic of said

wafer measurement apparatus, and

wherein said calculating means includes means for

mathematically multiplying said data by said matrix to achieve

noise reduction in said data.

24. (original) The apparatus of claim 23 wherein said calculating

means applies least squares fit analysis.

25. (original) The apparatus of claim 23 wherein said matrix is

of the form of a multiplier of a Zernike polynomial without

decomposition coefficients.

26. (original) The apparatus of claim 14 wherein said means for

calculating coefficients is a computer.

-8-

27.   (currently amended) A model-based method of wafer shape reconstruction comprising:

obtaining a set of noisy data points representing the wafer shape by a ~~measuring~~ wafer measurement apparatus,

wherein movement of said wafer within said wafer measurement apparatus induces noise in said noisy data;

using a complete set of Zernike polynomials as a shape functional space;

applying a weighted least squares fit between said noisy data points and a set of data points calculated from said Zernike polynomials,

wherein said weighted least squares fit is represented by a matrix, and said matrix represents a noise characteristic of said ~~measuring~~ wafer measurement apparatus; and

finding decomposition coefficients for said wafer shape,

wherein noise reduction is achieved in said noisy data by mathematically multiplying said set of noisy data points by said matrix.

-9-

28. (original) The model-based method of claim 27 wherein said decomposition coefficients are a compact wafer shape data representation.

29. (original) The model-based method of claim 27 wherein said set of noisy data points form a scanning pattern that is not necessarily evenly spaced.

30. (previously presented) The apparatus of claim 14, wherein said sample points lack regular geometrically prescribed locations on said wafer specimen.

31. (new) The process of claim 1 wherein the movement of said wafer specimen within said wafer measurement apparatus comprises a circular rotation of said wafer specimen.

32. (new) The process of claim 11 wherein the movement of said wafer specimen within said wafer measurement apparatus comprises a circular rotation of said wafer specimen.

-10-

33.   (new) The apparatus of claim 14 wherein the movement of said wafer specimen within said wafer measurement apparatus comprises a circular rotation of said wafer specimen.

34.   (new) The apparatus of claim 23 wherein the movement of said wafer specimen within said wafer measurement apparatus comprises a circular rotation of said wafer specimen.

35.   (new) The method of claim 27 wherein the movement of said wafer within said wafer measurement apparatus comprises a circular rotation of said wafer.

-11-